

that efficient end user prices must make a “contribution” to the joint and common costs of a provider, is the foundation of the efficient components pricing rule. If there were no such contribution in an efficient price structure, there would be no need for an ECPR; *all* prices would be set to equal (average) incremental costs, component prices included. Only in the very special case where a firm has no economies of scale, scope, or vertical integration (*i.e.* where single product firms are as efficient as multiproduct firms) would the ECPR collapse to that promoted by Baumol. *et al.* in their recent affidavit. The special case of applying the ECPR when there is no lost contribution reduces the ECPR to a meaningless triviality.

In this proceeding, setting end user rates is not at issue; the proper pricing of components based on cost is at issue. Accepting that the ECPR provides the proper and efficient relationship between end user prices and component prices, the Commission appears to have two logical options.

1. Assert that efficient local telephone companies can remain financially viable and are efficiently priced when end user prices equal incremental cost, then justify setting component prices equal to incremental cost; or
2. Establish the proper *relationship* between end user prices and component prices as described by the ECPR and allow competition (together with all the protections of the Telecommunications Act of 1996 and the antitrust laws) to determine rates, scope, and scale of outputs in both component and end user markets.

Clearly, the former choice requires findings of fact not required by the latter choice. Indeed, the facts available clearly point to the existence of economies of scale, scope, and vertical integration contrary to selecting the former choice. Subsequent portions of this affidavit provide further support for the latter choice and support a nontrivial application of the ECPR.

## II. The Present Position Advocated by Baumol, *et al.* Regarding the ECPR Does Not Appear to be Supported by Their Prior Writings

Robert Willig and William Baumol have prior writings on the efficient components pricing rule and on the importance of pricing above marginal or incremental costs. These prior writings include prefiled testimony written to withstand cross-examination and published work written to withstand the scrutiny of peers in the review process.

Testifying for AT&T in California a few years ago, Baumol argued that when scale economies are present, costs alone cannot determine optimal prices:

... in the presence of economies of scale, costs alone cannot determine which prices are consistent with maximal consumer welfare, and why demand must enter the price-determination process.<sup>6</sup>

Even in instances in which Baumol discusses pricing *at* long run incremental cost, (TSLRIC or long run marginal cost), it appears from his published writings that he believes the long run incremental cost of an intermediate product *includes the profit foregone on retail sales*. For example, Baumol first introduced his “parity principle” in a 1983 article. In that article, he discussed the pricing of trackage rights by “landlord” railroads for use by “tenant” railroads. He said: “The price of trackage rights must, of course, at least cover, among other things, the long-run incremental cost of the use of the track and facilities by the tenant railroad.”<sup>7</sup> He goes on to say in the same article that this long-run incremental cost figure must: “...compensate the landlord railroad for any net earnings which it must forego as a result of the tenant’s use of trackage rights.”<sup>8</sup>

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<sup>6</sup> Testimony of William J. Baumol on Behalf of AT&T of California, Inc. , Before the Public Utilities Commission of California, Application No. 88-07-020, 88-08-051, 89-03-046, September 1, 1989, page 13.

<sup>7</sup> Baumol, William J., “Some Subtle Pricing Issues in Railroad Regulation,” *International Journal of Transport Economics*, (April-August 1983), page 349.

<sup>8</sup> *Ibid.*, page 350.

Baumol made it clear some years later that he thinks pricing an intermediate product so as to cover foregone contribution from retail sales does not involve a “markup” over incremental cost. In their 1994 book, Baumol and Sidak elaborate on the trackage rights example and explain that Diamond and Mirrlees’ classic 1971 article on optimal taxation condemns as inefficient markups over marginal cost in the price of any intermediate good. They reply to this condemnation as follows:

There is no such conflict here, however, since true marginal cost must include all of the (social) marginal opportunity cost. The contribution derived from the tenant by the landlord is simply part of the landlord’s opportunity cost incurred in providing trackage space to the tenant: the contribution entails no Ramsey markup over *that* marginal cost (emphasis in the original).<sup>9</sup>

In the same book, Baumol and Sidak argue that “... a substantial opportunity cost can be borne by the LEC on the margin if, having permitted substantial incursions into its business by and IXC [interexchange company], it permits the IXC to sell still another unit of the product at the new output level.”<sup>10</sup>

On the page following the one just cited, Baumol and Sidak appear to contradict the point that the ECPR must begin with rebalanced end user prices.

In a competitive market, an incumbent will levy on a new entrant an access charge that will cover both the direct incremental cost of providing the access and its opportunity cost. As we have seen, the latter represents the contribution of the access-using service *either toward meeting a shortfall in the price of another service and/or toward recovery of the common fixed costs of supplying some or all of the incumbent’s services* [emphasis added].<sup>11</sup>

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<sup>9</sup> Baumol, William J. and J. Gregory Sidak, *Toward Competition in Local Telephony* Cambridge, MA: The MIT Press, 1994, page 106, footnote 4.

<sup>10</sup> Baumol, William J. and J. Gregory Sidak, *Toward Competition in Local Telephony* Cambridge, MA: The MIT Press, 1994, page 114.

<sup>11</sup> Baumol, William J. and J. Gregory Sidak, *Toward Competition in Local Telephony* Cambridge, MA: The MIT Press, 1994, page 115.

In this passage, it appears that the contribution required to meet a shortfall in the price of another service constitutes a proper application of the ECPR if the ECPR is to provide a surrogate for a competitive market.

In his 1986 book, *Superfairness*, at page 135, Dr. Baumol describes a “residue” of cost calculated as the firm’s total (forward-looking) cost less the sum of the firm’s incremental costs. This residue may exist even if the firm has no fixed costs (*e.g.*, even if the proverbial president’s salary is “variable”); a positive residue exists “if and only if there are economies of scope.”<sup>12</sup> Otherwise, costs could be “fully allocated” entirely on the basis of cost causation. The logical conclusion one must accept when taking Dr. Baumol’s writings on economic theory and his affidavit together is that no such residue, and therefore no economies of scope, exists. Yet, the Lords of the Judicial Committee of the Privy Council in the United Kingdom cited a joint brief of Professors Baumol and Willig (regarding the use of the ECPR in New Zealand) by saying:

However, in their [Baumol and Willig] view in an industry which enjoys economies of scale and scope (such as the telecommunications market) marginal cost was not the correct yardstick since such costs would not cover, for example, major fixed costs.<sup>13</sup>

While the issue here is pricing at Total Service Long Run Incremental Cost rather than marginal cost, the basic problem is the same: if incremental costs (of any flavor) do not sum to total costs, prices must be set above those incremental costs.

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<sup>12</sup> Baumol, William J. *Superfairness*. Cambridge, MA: The MIT Press, 1987, page 135.

<sup>13</sup> Judgment of the Lords of the Judicial Committee of the Privy Council from the Court of Appeal of New Zealand, Oct. 19, 1994, page 9.

The logical conclusion is inescapable: the only set of circumstances in which the writings of the authors (including their writings as interpreted by the Privy Council) can be consistent is that *all* of the following be true.

1. The local telecommunications industry in the United States has no economies of scale or scope in the production of basic network functions.
2. There are no economies of vertical integration in producing local basic network functions and local end user services.
3. Such economies of scope and vertical integration exist in New Zealand but not in the United States.

### **III. Joint and Common Costs in Telecommunications are not *De Minimis***

Baumol, *et al.* claim that “there are no significant common or shared costs among the groups of network elements,”<sup>14</sup> and “[w]e understand that the costs incurred in common between network elements and retail services are *de minimis*.”<sup>15</sup> This claim is, as argued earlier, necessary for their pricing conclusions. These claims must be rejected for at least four reasons.

#### **A. This claim is conjecture not backed by evidence**

Baumol, *et al.* provide no basis for this claim. They utilize the qualifier “we understand” as if to suggest that the claim is not based on evidentiary material nor on their direct experience. In the absence of meaningful support, this claim should be rejected as more conjecture.

#### **B. This claim contradicts other implications in the affidavit**

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<sup>14</sup> Baumol, *et al.* at page 4, footnote 1.

<sup>15</sup> Baumol, *et al.* at page 12, footnote 4.

Baumol, *et al.*, in essence, suggest that LECs have little or no shared, joint or common costs. However, other statements in their affidavit suggest that such costs do exist. At page 11 Baumol, *et al.* are careful to state that “TSLRIC includes only the additional cost of providing the particular network element(s) sought by the requesting carrier, holding constant the ILEC’s output of all other goods and services.” This definition is similar to others in the industry for TSLRIC; the point usually is that the definition specifically precludes the inclusion of joint and common or shared costs in a TSLRIC calculation. It is inconceivable that every unbundled combination of network elements to be made available as a result of this proceeding will have a cost structure which is “additive” rather than “subadditive.”

As if to emphasize the lack of empirical evidence for their conjecture, Baumol, *et al.* concede, “[t]o the extent that there are non-trivial common or shared costs among network elements ...”<sup>16</sup>. Obviously they are not so certain of their facts so as not to address the contrary situation. Public policy towards pricing should not be based on the assumption of empirical facts not in evidence.

**C. Suggesting that common expenses are volume-sensitive is not meaningful**

Baumol, *et al.* suggest that “a large portion of the [common] expenses may be variable with respect to the volume of business, and attributable to particular network elements.”<sup>17</sup> They appear to believe that “costs of this kind are properly included in the TSLRIC of the relevant network element,” and therefore shared, joint, and common costs are small or nonexistent.

First, anyone familiar with business enterprise in general will recognize that corporate operating expenses are larger for larger firms. Some of the costs of a LEC are necessarily greater when the LEC must serve a large geographic territory and a greater

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<sup>16</sup> Baumol, *et al.* at page 13, paragraph 35.

<sup>17</sup> Baumol, *et al.* at page 13, footnote 6.

number of customers. Larger firms serve larger geographic territories and larger numbers of customers and they will generally have larger costs of all kinds (incremental, joint, and common). Although shared, joint, and common costs are larger with larger firms, this correlation does not mean the joint, common, and shared costs are directly attributable to individual services or basic network functions (BNFs) <sup>18</sup>

Finally, the “residue” cost discussion earlier does not depend on costs being fixed. A residue exists if the differences in a firm’s total cost with and without each selected cost object (*ceteris paribus*) do not add to the firm’s total cost. It is this residue which constitutes all relevant joint and common costs and which requires prices in excess of incremental costs.

**D. Shared, joint, and common costs are well known in the telecommunications industry and are substantial**

I am surprised by the statements in the affidavit of Baumol, *et al.* that suggest that shared, joint, and common costs are nonexistent or *de minimis*. The existence of shared, joint, and common costs for multiproduct or multiservice firms, especially network-based multiservice firms, is widely accepted. In telecommunications in particular, the existence of shared, joint, and common costs has been widely recognized. The entire history of arguments over fully allocated costs has led us no closer to a cost causative basis for assigning all costs to services or to network functions. In this instance, failure speaks louder to success.

Although Baumol, *et al.* suggest that corporate overheads vary with the size of the firm, in his published writings elsewhere, professor Baumol indicates that such allocations or assignments are impractical.

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<sup>18</sup> If the dining area at a McDonalds restaurant is of a standard size (*i.e.*, it cannot be attributed to any individual service or family of services), these common costs will still be larger based on the number of restaurants. Similarly, common costs for a LEC are likely to be larger the more exchanges the company serves. The fact that some common costs occur at the restaurant or the exchange level does nothing to cause them to be attributable to individual services or even families of services.

The practical consequence is that incremental joint costs are not traceable to individual railroad services and can be allocated only arbitrarily. In contrast, those common costs which are incremental are traceable in principle, *although it may be impossible over a considerable range to do so in practice* [emphasis added].<sup>19</sup>

Other economists have noted the existence of joint, common or shared costs and economies of scope. For example, professor Almarin Phillips noted with regards to telecommunications:

Testing for the existence of strict economies of scope - distinguishing these from economies of scale - is difficult. Present and forthcoming technology has characteristics that indicate significant scope economies, nonetheless. Transmission, switching, and terminal facilities are increasingly being designed to accommodate many kinds of digitized information. The signals themselves may begin and end as voice, nonvoice verbal, numerical, graphic, or video communications. Whatever their content, the several services make joint and common use of a good deal of both the local exchange and interexchange portions of a modern communications network.<sup>20</sup>

Similarly Alfred E. Kahn and William B. Shew found:

At the core of almost all the pricing issues in telecommunications is the fact that the products of this industry are a large and increasing diversity of services issuing from *common* facilities. While telecommunications is by no means unique among the public utilities in this respect, the problem is much more pervasive and central here than in others. Whereas a kilowatt-hour of electricity is a kilowatt-hour and a cubic foot of gas a cubic foot (this is by no means to ignore the fact that a kilowatt hour or cubic

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<sup>19</sup> "The Role of Cost in the Minimum Pricing of Railroad Services," *Journal of Business*, Vol. 35, No. 4, October 1962.

<sup>20</sup> Almarin Phillips, "The Reintegration of Telecommunications: An Interim View," in Michael A. Crew (ed.) *Analyzing the Impact of Regulatory Change in Public Utilities* (Lexington, MA: Lexington Books, 1985), pp. 5-16, at 8.



foot supplied at one time of day on a firm basis is not the same service as at another time on an interruptible basis), telephone service is an array of services, decreasingly standardized over time, and therefore less and less susceptible to traditional regulatory treatment. Since regulators and economists generally accept the desirability of basing the prices of these services on their respective costs, the issues tend to be framed in terms of proper apportionment of their common costs among them, a task further complicated by the fact that some of the services have become subject to competition, while others continue to be offered by a single supplier, under close regulation.<sup>21</sup>

Professor Baumol himself, in prefiled testimony in the state of Missouri stated:

Q. ONE OF THE REBUTTAL WITNESSES HAS SUGGESTED THAT STRUCTURAL SEPARATION IS THE PROPER MEANS FOR THE COMMISSION TO PREVENT SUCH CROSS-SUBSIDY. WHAT IS YOUR VIEW OF THE STRUCTURAL SEPARATION APPROACH?

A. It amounts to throwing out the baby with the bath water. Whatever difficulty there is to the control of cross-subsidy arises from the presence of common plant and common use of other inputs that makes it possible for two services to be supplied more economically and efficiently when they are provided together rather than by two separate entities. Such economies of scope obviously are a prime source of benefits to consumers. The cross-subsidy issue these common facilities pose is, in essence, how those benefits should be divided between the customers of the two services involved. The structural separation solution amounts to a decision to forego those benefits altogether in order to avoid having to divide them up between the prospective beneficiaries! Surely very little can be said in favor of such a "solution." (p. 11)

The FCC, incidentally, has recognized this problem. Notice of Proposed Rulemaking, FCC Docket No. 85-229, August 16, 1985. In its plan for the Computer Inquiry III, the FCC explicitly indicates that to avoid further waste of valuable economies of scope it is turning toward the use of accounting tools

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<sup>21</sup> Alfred E. Kahn and William B. Shew, "Current Issues in Telecommunications Regulation: Pricing," *Yale Journal on Regulation*, (1987), reprinted in Alexander C. Larson and Mark E. Meitzen (eds.) *Cost and Pricing Principles for Telecommunications: An Anthology* (Washington, D.C.: United States Telephone Association, 1990), pp. 53-118 (emphasis in the original; footnote omitted) (p. 56).

for avoidance of cross-subsidy rather than continuing recourse to structural separation. (pp. 11-12)<sup>22</sup>

L.C. Hunt and E.L. Lynk, in comparing joint production in telecommunications in the U.S. and the United Kingdom find:

The question of joint production and its potential costs is therefore vital for the formulation of public policies concerned with the appropriate structure of the UK telecommunications industry. The argument for separation of inland and international services rests largely on the potential cost reduction. The results presented here suggest that these would have to be considerable to compensate for the benefits conferred by joint production.<sup>23</sup>

Professor Michael Einhorn discusses the existence of joint and common costs in the context of allocations of such costs:

In traditional rate-of-return regulation, regulators price utility services in order to recover the company's variable costs plus an allowed rate-of-return on its rate base. At times, prices are set at fully distributed costs; cost distribution methods attempt to assign joint and common costs fairly across the utility's different services.<sup>24</sup>

Indeed, it has proved impossible in telecommunications to fully allocate (forward-looking, economic) costs to network functions or services. Whether this is due to practical limitations or a true lack of cost causation is less relevant than the fact that untraceable costs must be covered by prices.

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<sup>22</sup> Surrebuttal Testimony of William J. Baumol, Before the Public Service Commission of the State of Missouri, Case Nos. TO-84-223, TO-85-126 and TO-85-130, *et. al.*, October 23, 1985.

<sup>23</sup> Hunt, L.C. and E.L. Lynk, "Divestiture of Telecommunications in the UK: A Time Series Analysis," *Oxford Bulletin of Economics and Statistics*, Vol. 52 No. 3 (Aug. 1990), p.244.

<sup>24</sup> Einhorn, Michael A.. *Price Caps and Incentive Regulation in Telecommunications*, Boston (Kluwer 1991)p. 2.

Consider generalized advertising as advertising which is not specific to any particular product, service or BNF and which serves to make a company known or liked by its existing and prospective customers. Such advertising cannot be attributed to BNFs or services.<sup>25</sup> Similarly, portions of the following expenditures and activities are clearly not attributable to individual services or BNFs:

- corporate legal staff (*e.g.*, those tending to general business matters);
- human resources functions (*e.g.*, those required to comply with labor laws);
- forecasting and cost studies functions (*e.g.*, those activities required to support all categories of plant);
- general network engineering functions;
- general network planning functions;
- franchise and business licenses costs;
- right-to-use fees which provide, at no additional cost, for more than one service or basic network function;

Incremental cost studies already performed by LECs, many of which largely or entirely conform to the principles proposed by Baumol, *et al.* at page 9, fall short of describing the full economic costs of providing services in a network environment. My staff and I have consulted on, reviewed, or actually calculated hundreds of incremental cost studies for telecommunications providers. This work has included substantial work involving the incremental costs of basic network functions. It is absolutely clear that many costs are not traceable to services or network functions and are therefore excluded from incremental costs, and it is equally clear that such excluded costs *are* substantial as cost studies are performed today.

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<sup>25</sup> A LEC which only serves a single city might purchase such advertising from the city newspaper. In contrast, a LEC serving five states would spend substantially more on generalized advertising, perhaps by advertising in a newspaper in each city it serves. However, the greater dollars spent on generalized advertising by the large LEC does nothing to somehow cause these costs to become directly attributable to individual services or BNFs.

One public domain result indicates that only 50% of the costs of Bell South's operations are included in the incremental costs.<sup>26</sup> All of the confidential estimates of shared, joint, and common costs with which I am familiar are substantial as well. Shared, joint, and common costs are substantial, they are not *de minimis*.

**E. Even when considering costs at the BNF level, shared, joint, and common costs still exist**

While most incremental cost studies have been performed for services, BNFs appear to result in substantially subadditive costs as well. First, note that Baumol, *et al.* imply that there are only four BNFs which will exist (loop, switching, transport, and signaling).<sup>27</sup> However, even though these four terms may reasonably represent the four *categories* (a term Baumol, *et al.* use in the subsequent sentence) these categories do not represent the actual number of BNFs which are likely to be sold separately. For example, in Texas, after an extended process of defining basic network functions, the BNFs which will exist number in the hundreds to as high as 3,000. To imply that loop, switching, transport, and signaling will in fact become the four BNFs, each sold in a well defined unit of measure, is not credible and contradicts actual practice in the industry to date.

Part of the implication of Baumol, *et al.* may be correct: it is likely to be true that the more broadly one defines either the set of services or the set of BNFs, the smaller will be the residual shared, joint, and common costs of the provider. By illustration, one could define a BNF as simply "all telecommunications function" and perhaps there would

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<sup>26</sup> Testimony of Frank R. Kolb, before the Georgia Public Service Commission, Docket No. 5755-U (Petition for Removal of Subsidies from Switched Access Rates) at 3. "Q. Could Southern Bell Price all of its services at incremental cost? A. Not if Southern Bell wants to stay in business. The incremental cost of all services provided by Southern Bell Represents approximately 50% of the total cost of doing business. Obviously, basic flat residence service is not providing any contribution toward the shared and common costs." While the 50% figure is based on a comparison of total embedded to total incremental costs, the prospective valuation of the shared, joint and common costs must be very large as well. Any divergence between prospective and embedded valuations (whether positive or negative) must be considered in the legacy costs of past regulation and recovered (or reduce the value) in a universal service mechanism.

<sup>27</sup> Baumol, *et al.* at page 13, paragraph 35.

be no residual costs.<sup>28</sup> However, in practice, the number of BNFs which will exist will be substantially greater than four.

It seems especially peculiar to consider as few as four BNFs when the very nature of the process is to provide for *unbundling* of services. Unbundling is generally considered to create a greater rather than a smaller array of component offerings.

Even holding aside the important issue that there will likely be a large number of BNFs within each family of BNFs, in contrast to the statements by Baumol, *et al.*, there are clearly instances in which economies of scope or cost subadditivities exist even *across* these four broad categories of functions. The possibilities for such economies are myriad and nearly endless. For example, loop and transport functions can and do utilize shared network planning and engineering and maintenance operations, and in some instances they even share investments and structure. Similarly, signaling and switching benefit from shared facilities, software, and personnel costs. And, obviously, all functions or services share in the benefits offered by the costs which are genuinely common and required for the existence of the firm in total and cannot be attributed to any service, BNF or category of BNFs or services.

Finally, Baumol, *et al.* argue that investments incurred for future growth is not an incremental cost of current demand.<sup>29</sup> It is clear to me and to those network engineers with whom I work that “just in time” network placement is not efficient. Thus, efficiency requires that capacity now be placed for future demand. Yet present demand assumes no such costs from the past. The implication is that such costs are excluded from both present and future incremental cost studies. These shared costs are captured as a residue when today’s and tomorrow’s demands are taken together. Thus, there are intertemporal shared costs of BNFs which require a contribution.

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<sup>28</sup> Certainly, “all telecommunications functions” could be considered a “category” of functions, as Baumol, *et al.* have used this term. Of course, there would be a problem defining the unit of output without violating the spirit of the unbundling requirements of the Telecommunications Act of 1996.

<sup>29</sup> Baumol, *et al.* at page 11, paragraph 30.

Again, the conclusion is evident: to disregard the potentially important economies of scope across BNFs and services without strong empirical evidence would be a poor basis for important and long lasting public policy.

#### **IV. Treatment of Dynamic Factors in Cost Studies Must Match Arguments Regarding Dynamic Requirements for New Entrants**

Baumol, *et al.* argue that TSLRIC must be calculated to reflect the most efficient provision of service, using the least-cost technology to serve only the current quantity demanded. They appear to suggest that capacity placed to allow for the possibility of serving future customers, because of growth, would not be allowed or included in the TSLRIC calculation. The resulting shared cost was taken up earlier. Here, I make a different point. In essence, they argue that the unavoidable dynamic characteristics of real markets should not be included or reflected in the TSLRIC calculations. They recommend a cost calculation reflecting instantaneous deployment of whatever type of technology for a given location will prove (at the time of the TSLRIC calculation) to be the least cost for serving the current demand (at the time of the TSLRIC calculation).

However, this perspective on TSLRIC (in stripping it of any dynamic content) is diametrically opposed to the arguments Baumol, *et al.* make for resale pricing and the pricing of unbundled basic network functions at TSLRIC. Their arguments regarding the needs for new entrants are fully based on dynamic considerations. The costs to construct facilities is enormous. They suggest that special consideration must be given to new entrants because they cannot instantaneously place new facilities with new technology in an instantaneous manner. New entrants can only place facilities slowly over extended periods of time. Of course, the very fundamental nature of their arguments regarding the

need for special treatment of new entrants because of the dynamic process of placing facilities slowly, underscores the friction with which costs are incurred.<sup>30</sup>

## **V. The LEC's costs should be used to price rather than using the costs of an hypothetical efficient entrant**

Baumol, *et al.* recommend pricing based on a cost of an efficient firm entering the business *de novo*. This proposal does not comport with competitive markets as they function in practice. First, to the extent that any inefficiencies exist within the LEC's today, they will make LECs more vulnerable to competitors only if their prices reflect such inefficiencies. In unregulated markets, prices reflecting less efficient production is the very engine which fuels the competitive process. It is only through price signals that firms which are equally or more efficient than existing providers will have an incentive to actually enter and be more efficient. It is only through the competitive process that the market determines which providers (each considering their own opportunity costs of their own resources) should and will offer service.

Second, the notion of Baumol, *et al.* that TSLRIC is based on the configuration of the most efficient provider, in a theoretical sense, does not comport with actual markets and market behavior. In real markets, firms do not have homogeneous cost and production functions. In the competitive process it is the costs of the *least efficient* provider which actually survives in the market, which reflects the price in the market. Even in this circumstance, it is the full economic cost (including joint, common, and shared costs and a normal return on investment) of the least efficient provider which

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<sup>30</sup> It is also noteworthy incumbent LECs, because of their carrier of last resort (COLR) obligations to place facilities well in advance of the actual demand for service must always have facilities placed for demand beyond the current level of demand. New entrants have the opportunity to place facilities at the speed, scale, scope, and location of their choosing; because of this, new entrants should have an inherent cost advantage over incumbents.

represents the prevailing prices in the market. Other, more efficient providers, through superior resources, better planning or luck, reap returns to their superiority.

Finally, every firm faces the prospect of incurring sunk costs upon entry. Just as firms trade off fixed for variable costs to minimize risk and costs, so too do firms trade off sunk expenditures for liquid expenditures. To create rules which disregard sunk costs would not only distort the selection of productive assets by firms but would fundamentally alter the very incentives to enter and exit which competition so efficiently provides. This argues for using a LEC's achievable costs in setting prices. Achievable costs reflect the state of the existing asset base of an incumbent, allowing new entrants to advantage themselves using newer technology. Once entered, however, the entrant makes the most economical *changes* to its assets through time. It too then competes based on its *achievable costs* including their prospective or prior irrevocable commitments. This results in a heterogeneous industry. This heterogeneous set of costs makes up the industry cost function and, as the traditional textbooks tell, it is the marginal firms which enter and exit the industry based on their respective unique efficiencies as market prices change. To assume every firm has the homogeneous cost structure of a theoretical entrant strips the competitive process and its surrogates of some of its important dynamic characteristics.

## **VI. All Services Should Provide a Reasonable Contribution to the Joint and Common Costs of the Provider**

It is absolutely critical to recognize that substantial shared, joint, and common costs exist in the provision of local telecommunications. Once this is recognized, the critical issue of how and where contribution can be obtained to cover the shared, joint, and common costs.

- A. A network-based company with joint and common costs cannot survive by setting its service or BNF prices at TSLRIC**



Establishing service BNF prices which only generate total revenue equal to the sum of all service or BNF TSLRICs will not cover the firm's total cost. There are shared and common costs incurred by the firm, especially a multiservice network-based LEC, which are *not* incremental to any one service or BNF but which are valid costs of engaging in its business activities. In total, service revenues must exceed service incremental costs by a margin sufficient to recover all economic costs of the firm, including the shared and common costs of the firm.<sup>31</sup> To simply assure that each service does not receive a subsidy, by establishing all service prices at, or slightly above, TSLRIC, does not guarantee that the firm recovers all of its costs or is economically viable.

The greater the efficiencies of sharing facilities and costs, the larger the shared and common costs of the firm and the greater the need to price services in excess of TSLRIC. In other words, such increased efficiencies will reduce incremental costs but increase shared and common costs. However, these shared and common costs must be recovered for a firm to remain in business. The firm needs latitude to select the most efficient means of production with the discouragement of avoiding shared costs because pricing rules preclude their recovery.

The increased efficiencies from sharing facilities and costs is desirable for the firm and desirable for society as well. However these costs must be recovered from either subsidies or from the services which the firm provides; pricing services at TSLRIC without supplementary subsidies does not allow for the recovery of the shared and common costs which are beneficial to society. It is inappropriate to penalize a company for improving its efficiency by not allowing recovery of shared and common costs. It is most appropriate to allow for their recovery in the same manner as markets allow: through prices in excess of incremental costs.

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<sup>31</sup> For simplicity, I will use the term "service" rather than the phrase service or BNF since in practice a BNF only becomes meaningful once the BNF is actually unbundled and offered as a service.

<sup>32</sup> The efficiencies due to sharing facilities and costs in the provision of multiple services is sometimes called economies of scope. This is similar to, but distinct from, the concept of economies of scale which reflects cost savings from large scale production of a particular (a single) product or service.

Once one recognizes the existence of joint, common, and shared costs it is then important to establish prices which will provide contribution sufficient to recover these economic costs. Service prices should be set based on market conditions in such a way that the contributions from all services (revenues in excess of incremental costs) are sufficient to cover the shared and common costs of the firm. It is the value of the service to the customer and the market conditions for that service, not cost-based formulas, which will determine how shared and common costs can be recovered in the marketplace. Every service should provide a contribution toward shared and common costs, based on market conditions.

**B. There is no valid formula which uses only TSLRIC to create a price**

Unfortunately, there is no formula which allows one to simply take TSLRIC and determine a price for a service. Incremental cost provides the information necessary to establish a floor for service pricing and part of the information to test for cross-subsidization of services.<sup>33</sup> However, TSLRIC information by itself is insufficient to establish the upper bound for pricing or to determine the price of the service itself.

In general, establishing service prices for the full complement of services a firm offers requires three types of information: 1) incremental cost (establishing the lower bound for the price); 2) market/demand information; and 3) the total shared and common costs of the firm (establishing the total level of contribution required from all services in total to sustain the firm in the long run).

Finally, while some economists argue that, properly measured, incremental costs include lost (or gained) contribution from cross elastic services (indeed, support for the ECPR is based on such an argument), and, therefore, prices equal to incremental cost are appropriate, the rules governing the construction of TSLRIC requires that such effects be ignored. Thus, competitive prices will not equal (average) TSLRIC. Again, I conclude that TSLRIC alone is an insufficient basis for pricing.

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<sup>33</sup> Service demand and revenue information provides the other source of information for testing for cross-subsidies.

**C. Competition drives prices toward economic costs which include shared and common costs**

In the rarefied case of perfect competition, prices equal marginal cost and TSLRIC.<sup>34</sup> However, competition in real markets does not necessarily drive price toward TSLRIC.<sup>35</sup> Competition tends to drive prices to a point where all valid business costs of the least efficient surviving competitor, including efficiently incurred sunk costs, are just recovered, and shared and common costs are valid and desirable costs of business activity. When competition drives prices toward costs, these shared and common costs are a component of the costs a provider must recover, even in the most competitive of markets. In essence, competition in real markets tends to drive prices to the full economic costs or the full opportunity costs of providers.

In contrast, economics indicates that service prices should reflect the size of the shared and common costs of the provider and the market/demand conditions faced by each service.<sup>36</sup> With any set of retail prices which reflect or allow recovery of shared, joint, and common costs, the ECPR will produce input prices which also provide for input services to participate in the recovery of these economic costs. Every service should make a reasonable contribution toward the shared and common costs of the provider.

**D. “Intermediate” or “unbundled” services should provide a reasonable contribution to shared and common costs**

In a competitive environment with economies of scale, scope, or vertical integration, every activity must make a reasonable contribution toward the shared and

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<sup>34</sup> In long-run equilibrium in the model of perfect competition long-run marginal cost equal short-run marginal cost and TSLRIC or average total cost. The assumptions underlying this model are quite restrictive and few if any real markets can be approximated by this model. However, it is important to note that even in this model, all of the economic costs of perfect competitors are recovered in long-run equilibrium.

<sup>35</sup> If a firm only provides a single product, all of its costs will generally be included in a calculation of TSLRIC. Because the majority of the economics literature implicitly or explicitly deals with single product production, a casual reading of parts of the economics literature would lead one to believe that competition drives prices toward TSLRIC; this is true only for a single product firm.

<sup>36</sup> The economic literature on multipart pricing, economies of scope, optimal two-part tariffs, optimal taxation, and Ramsey pricing provide some of the academic support for this position.

common costs of the firm.<sup>37</sup> Many firms strictly offer business-to-business services, *i.e.*, they only offer intermediate products or services to other firms and do not sell to end-users.<sup>38</sup> Many of these firms may have substantial shared and common costs which must be recovered from the prices of the intermediate products or services which they sell to other firms. It is obvious in these instances that providers must obtain a reasonable contribution from each intermediate service or they will be unable to continue in business.

It is equally true that firms offering both final and intermediate services have a need to obtain such contributions from all services: there is nothing in the economics literature which generally exempts intermediate goods from providing contribution.

## **VIII. The Cost Proxy Model (CPM) Developed by Pacific Bell and INDETEC International is the Superior Cost Model to be Used if a model is to be used for pricing**

### **A. What is the Cost Proxy Model**

Pacific Bell and I and my staff at INDETEC International have co-developed the Cost Proxy Model (CPM) to help prepare telecommunication companies and regulators for the impending changes for Universal Service funding by improving the quality and quantity of information available to make and support universal service and related policy decisions. By integrating sound financial, engineering, economic, and managerial

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<sup>37</sup> Neither competition nor contestable markets allow a service to be subsidized by other services.

<sup>38</sup> Catalogs and directories exist for "business-to-business" products and services; many of these products are used as components or inputs to produce products for final consumers. Some of the firms which are largely or completely intermediate-products firms are obvious and well known such as Intel, Boeing, McDonald-Douglas, U.S. Steel, Alcoa Aluminum, or Peabody Coal. However, many other firms which one might consider as final goods producers, such as Beatrice Foods, Detroit Diesel, Kellogg, Phillip Morris, Proctor & Gamble, or Frito Lay, provide relatively few, if any, products to end users. These firms rely on other firms to actually provide products to end users. Certainly, any firm which only provides intermediate services must recover *all* of its joint and common costs from those intermediate services.

<sup>39</sup> With other services such as links, the sale of the link could cause very large implicit opportunity costs because of the loss of contribution from toll services and vertical services which would otherwise have been provided by the LEC. (is our preference to use the term "link" or "loop"?)

accounting principles, CPM provides the costs, revenues, and resulting subsidy of providing Universal Services. Since the CPM was constructed by determining costs component by component, the cost of components underlying services can be readily identified.

The essence of the concept and methodology of the Cost Model (CPM) is to aggregate the diverse costs of serving customers in different locations under different circumstances while retaining adherence to standard economic and engineering principles. This is accomplished through the use of readily available data, calculations, and algorithms to approximate the actual costs of providing service in an efficient and economically sound manner, incorporating efficient current and forward-looking engineering practices.

Some of the more important methodological approaches that the CPM incorporates include:

- A “bottoms-up” approach to cost by separating costs of providing service into small components, thus providing a highly granular level of detail. This approach provides a solid base for cost estimates at both the component and more aggregate service levels.
- Costs are expressed in meaningful metrics such as cost per foot aerial copper, cost per switched minute of use, or cost per bill. These metrics can be assembled into components and services in a consistent and realistic manner.
- Customer and geographic data requirements can be met through company proprietary data or via a number of commercially available governmental and private data providers.
- Utilizing a “grid” approach to geographic conversion allows CPM to summarize costs in a number of related ways, such as:
  - By Central Office;
  - By Census Block Group;
  - By City/County

■ **By Political Boundaries**

- By starting with a small, uniform geography, maximum flexibility in providing cost summaries is maintained. Yet the grid size chosen<sup>40</sup> also is large enough to capture that density information needed to select engineering criteria for network design. The CPM uses a flexible table driven database that can accommodate alternative lists of cost elements to be included in the definition of Universal Service.
- Operating expenses are not driven by investment. Rather, operating expenses are developed by cost causation principles. In addition, these operating expenses are adjusted to account for the operational efficiency of the company.
- The CPM costs represent the cost of service or service components that could be provided in the most efficient/cost effective manner using forward-looking technology and engineering guidelines. This is the most important characteristic of a total service long run incremental cost (TSLRIC).
- The CPM is capable of separately identifying the cost of serving each premise using the actual type of equipment best suited for each company.<sup>41</sup> However, it is not practical to determine the actual cost of every customer serviced by each company in a nationwide model. Nor would it be appropriate if efficient practices are not currently being employed. Therefore, the CPM is adapted to accept any specified engineering criteria and equipment characteristics.

**B. The CPM is superior to other models**

Although numerous models have been developed to date, the CPM is the only one that meets all the following criteria.

■ **The CPM is efficient and easy to use**

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<sup>40</sup> The grid size used to implement the CPM may be altered with some effort if necessary.

<sup>41</sup> Such an implementation of the CPM was accomplished in Pacific Bell's service territory, incorporating the component investments and costs from such standard models as Bellcore's Switching Cost Information System (SCIS).

The Cost Proxy Model is an efficiently designed database model that utilizes small easily understood data tables. This design allows the following:

- \* Most engineering rules are placed into tables so that engineering criteria can be changed easily by altering the values in the tables.
- \* All costs are defined as costs elements, or components. These elements provide the granularity and flexibility to the model and can be removed or added in a matter of minutes. Compound costs can be readily identified.
- \* The table-driven approach allows for easy maintenance.
- \* The CPM allows for quick analysis using a consistent, small unit of data referred to as a grid (~3000 ft. by 3000 ft. square).
- \* The CPM is optimized to allow for quick scenario analysis.

■ **Consistent unit of geography**

The CPM is based on a consistent, flexible unit of geography called the grid (1/100 of degree Longitude by Latitude or ~3000 ft. x ~3000 ft.). Currently, the CPM derives the household information at the grid using Census Block data that is apportioned to the grids they overlay. In the near future, the apportionment of Census Block data to the grids may be based on the locations of Zip+4 postal codes.

By splitting the country into 1/100 of degree Latitude and Longitude, the CPM is granular enough to accurately capture distances, serving wire centers, etc. In addition, this flexible grid unit is able to be summarized into any unit of geography that a user may be interested in. These units may include Wire center, Census Block Group, City, County, or Political Boundary. The grid can also be rolled up into a number of demographic levels such as age, household size, income and home ownership.

The use of this grid along with the use of Wire Center boundaries (available from commercial databases) minimizes the problem present in other models of misassigning customers to the wrong wire center and

ultimately to the wrong serving local exchange companies. The CPM assigns a Grid to a wire center based upon the wire center boundary within which the centroid of the grid falls.

In addition, by using a small uniform geography, the CPM minimizes miscalculation of distances. By calculating distances to only those grids that have household counts, the CPM avoids the design pitfalls of incorporating empty grids in the distance calculations necessary for representing sound engineering practices. The CPM algorithm calculates the air distance from the centroid of the grid to the serving wire center. It then converts this Air distance into Feeder and Distribution. This conversion is based upon statistically derived ratios developed from actual Pacific Bell records. Finally, it converts the air distances into route distances. This second conversion is again based upon statistically derived ratios. These ratios incorporate parameters that influence the conversion. For the distribution plant, the distance from the wire center is used to develop the ratios. For example, the ratio for air distances less than 500 ft. is 2.2 while the ratio for air distance over 3000 ft is 1.2. On the feeder side of the plant, the density zone that the plant falls in is used to calculate the ratio.

■ **Accurate assessment of density for sizing plant**

In addition to collecting Census household data at the grid level, the CPM also uses Daytime Population data at the grid level to estimate numbers and locations of business lines. Using the total lines (residential + business) within the grids, the CPM assigns a density measure to a grid based on the average density in the grid and the 8 surrounding grids. By using this moving average density measure, the CPM is able to more accurately determine the correct sizing of distribution cable that would be needed to satisfy the total demand in an area or to satisfy the increment of demand of interest.



The use of the grid as the density measuring point also avoids the misclassification of an area that could occur when a larger geographic unit (*e.g.*, CBG) is used. This misclassification occurs when the population within a CBG is clustered and very dense. By using the CBG as the density aggregation point, the dense cluster will be averaged with the non-populated or sparsely populated territory in the remaining portion of the CBG. The result for the entire CBG is that the entire CBG is now considered rural.

This use of the daytime population and the moving average density methodology also avoids classifying an area as rural based on the fact that the area is mostly business. Therefore, the efficiencies of offering business lines is correctly incorporated into the cost of the residential lines.

■ **Separation of operating expenses from investment**

To avoid the mischaracterization and misappropriation of costs, the CPM correctly separates operating expenses from investment in the model.

Operating expenses are an important category of costs. For example, about 50% of the cost of Universal Service in California is operating expenses. To assume that these expenses can be approximated at any geographic level using a simple, single factor would produce unacceptably inaccurate results.

The CPM uses investment only to determine the capital costs (depreciation, return and taxes) of the company. The operating expenses are developed as an expense per line, utilizing an Activity Based Cost (ABC) approach whereby cost causation principles are employed (*e.g.*, cost per bill).

This approach and the table design of the CPM:

- \* Allows the user of the system to determine what is and what is not included in the definition of Universal Service or any other service or component of service of interest. For example, if Directory Assistance is deemed not a part of Universal Service, then a simple table change will eliminate the cost from the CPM reports.